T00T20" 09025260

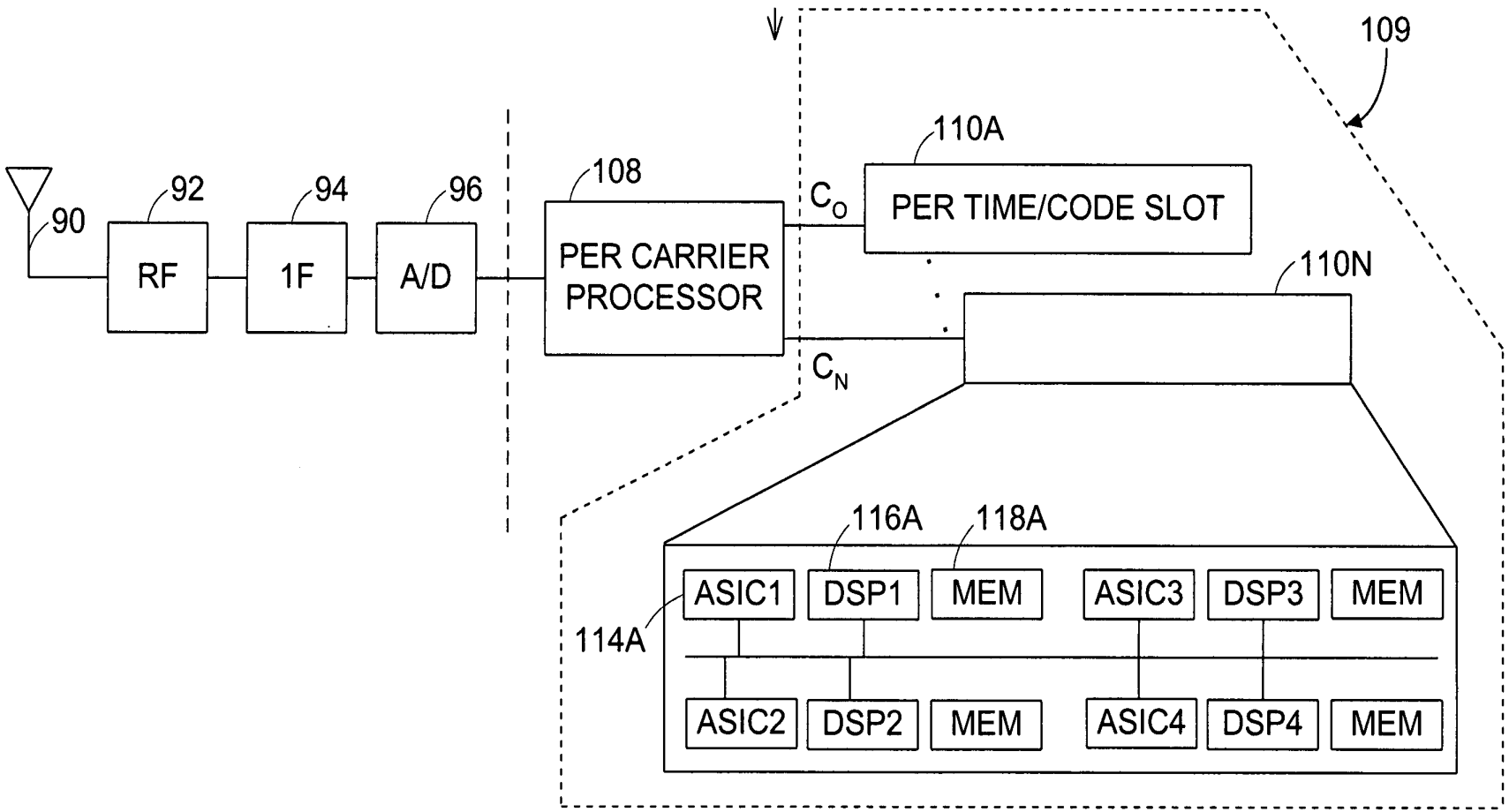


FIG. 1

(PRIOR ART)

TOOT20"05025760

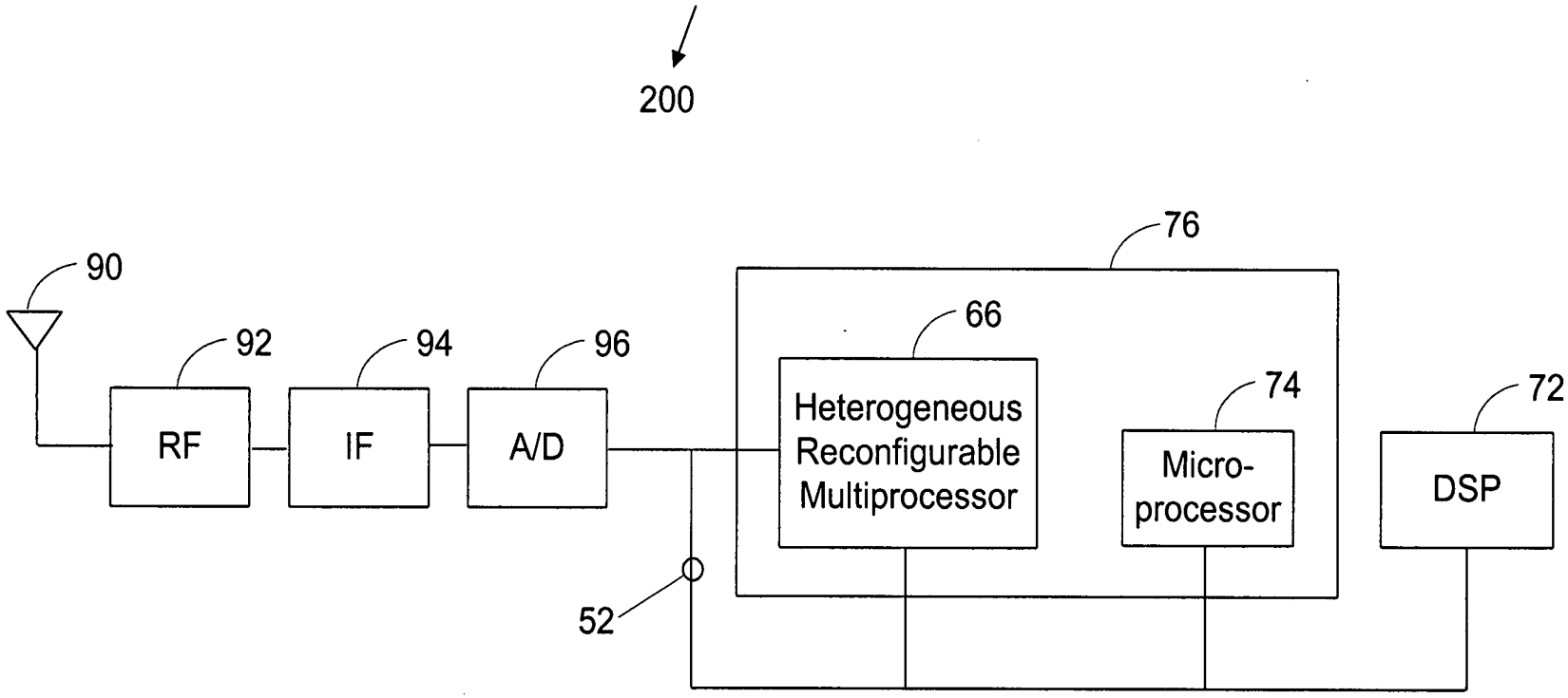


FIG. 2

T08T20 05025260

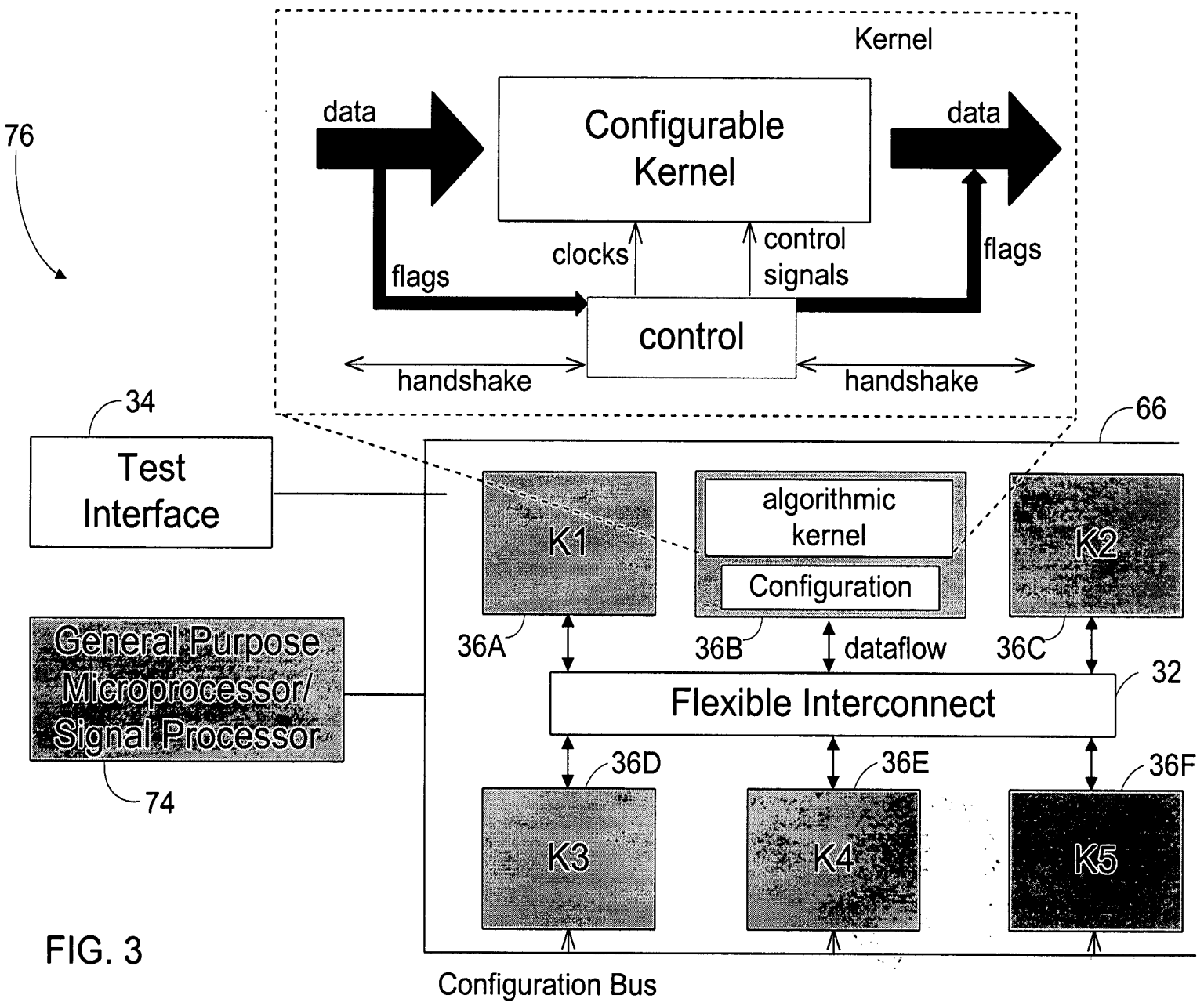


FIG. 3

T00T20"05025260

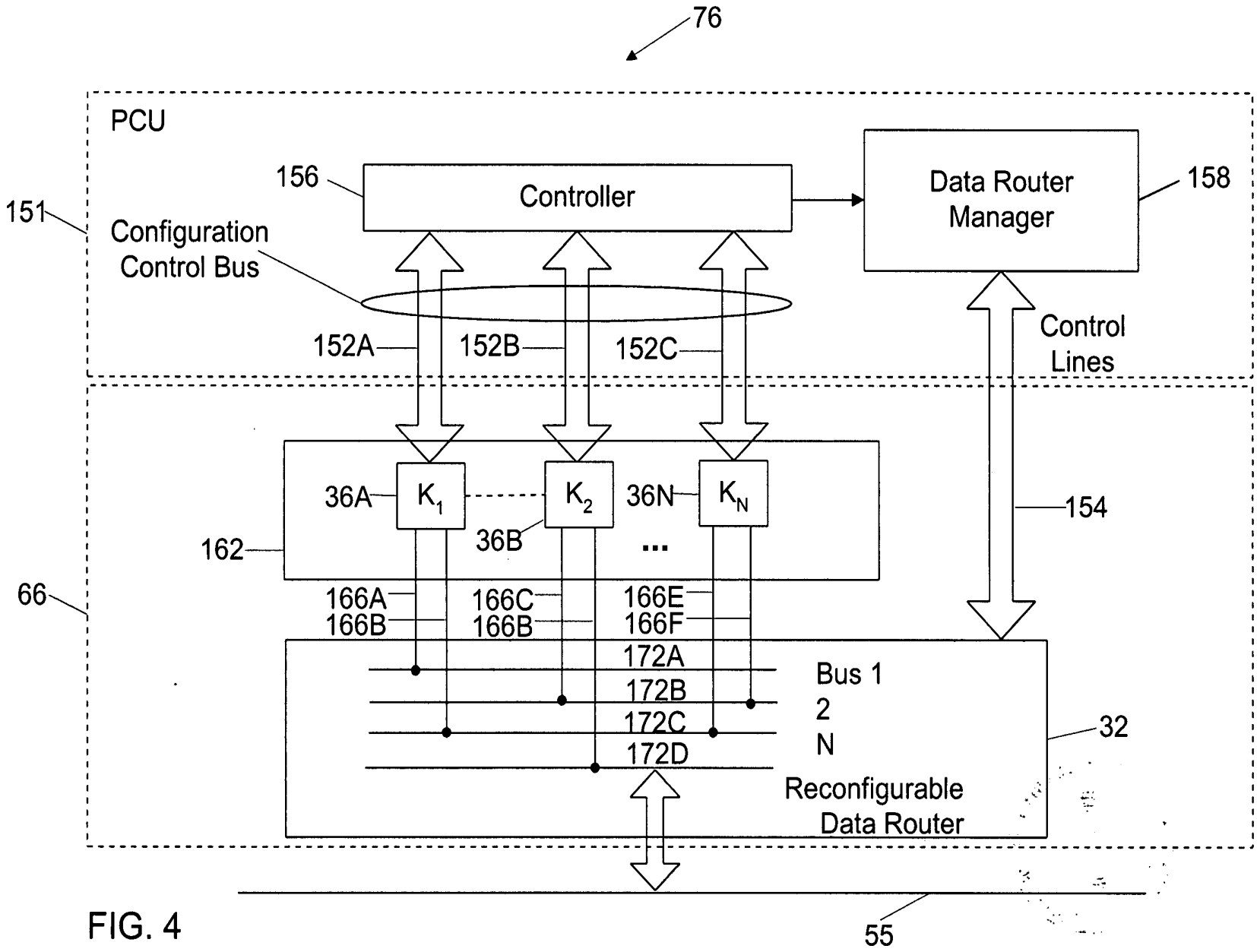


FIG. 4

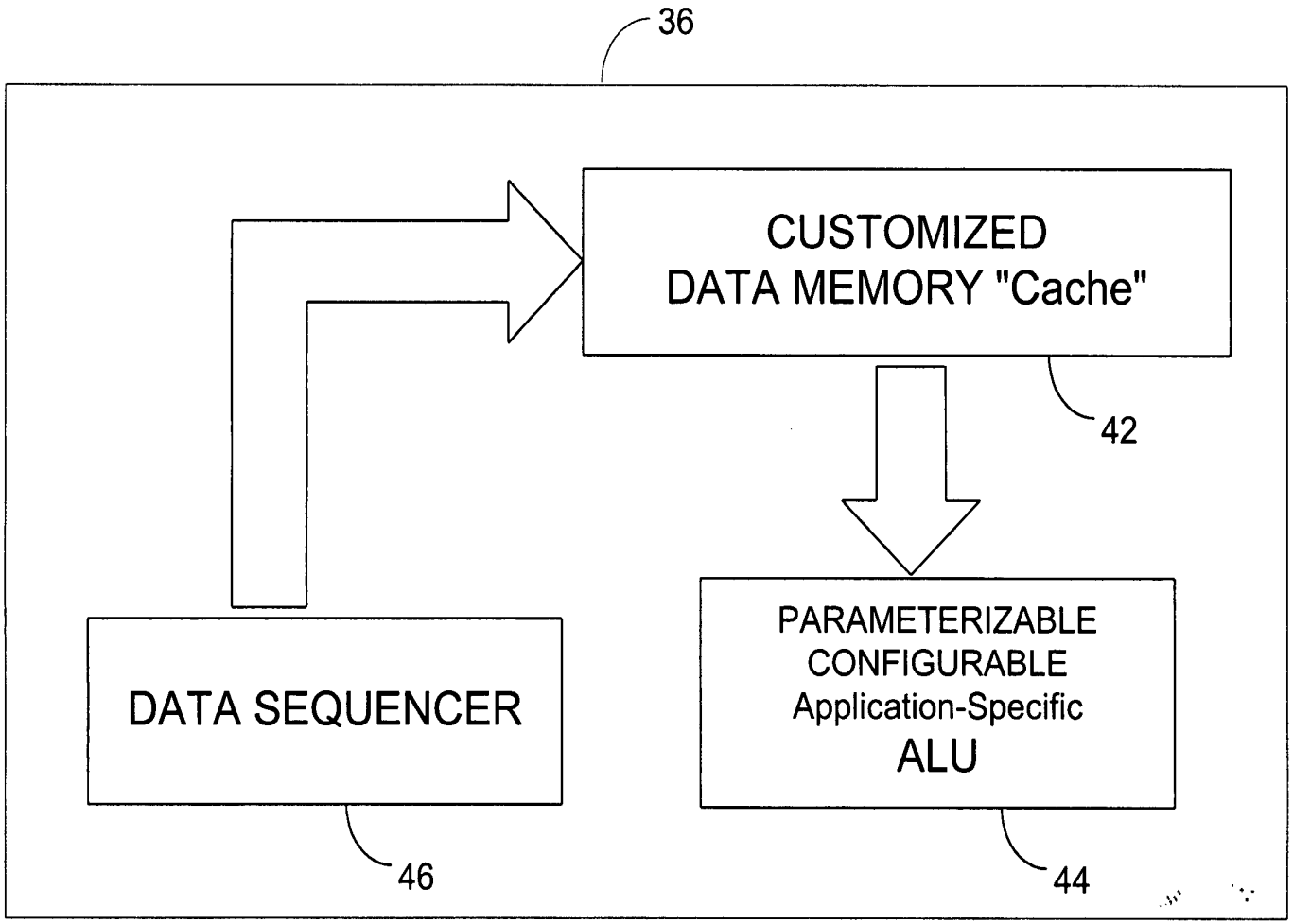
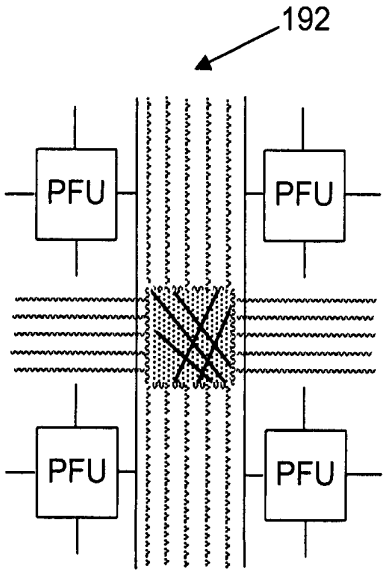

36
CUSTOMIZED
DATA MEMORY "Cache"
42
DATA SEQUENCER
PARAMETERIZABLE
CONFIGURABLE
Application-Specific
ALU
46
44

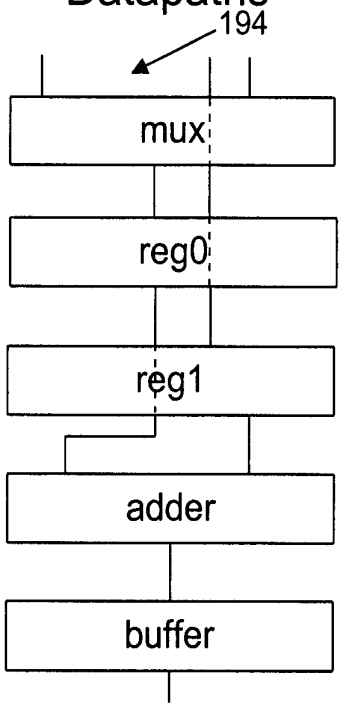
FIG. 5

Reconfigurable Logic with Programmable Functions Units (PFU)



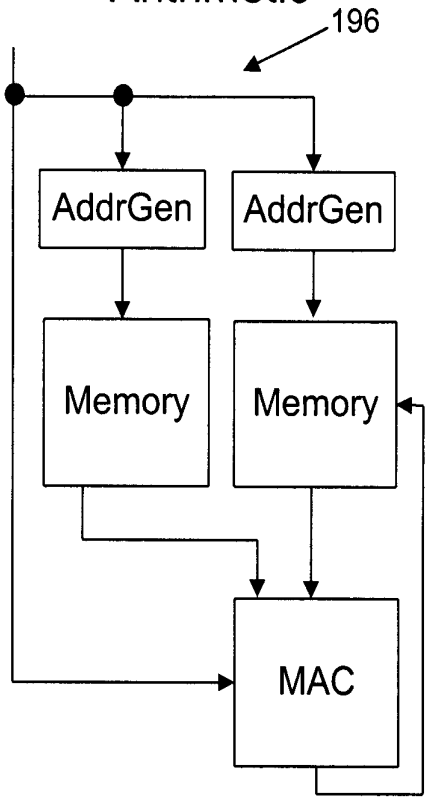
Bit-Level Operations
e.g. encoding

Reconfigurable Datapaths



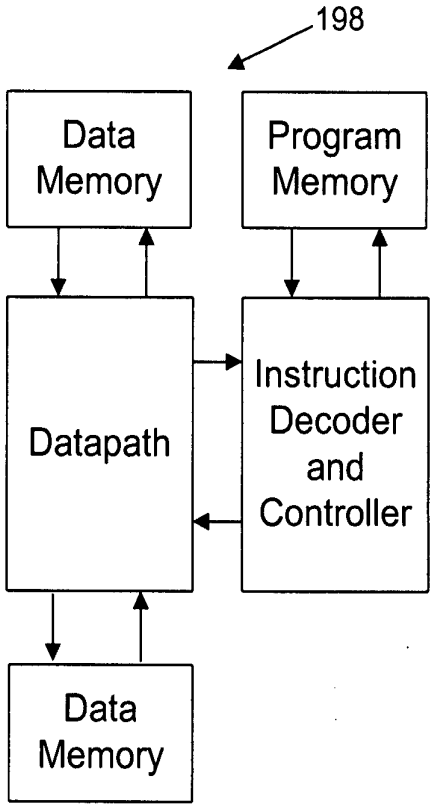
Dedicated data paths e.g. Filters, AGU

Reconfigurable Arithmetic



Arithmetic Operations
e.g. Convolution

Reconfigurable Control



RTOS
Process Management

FIG. 6

TOOT20 "05025260

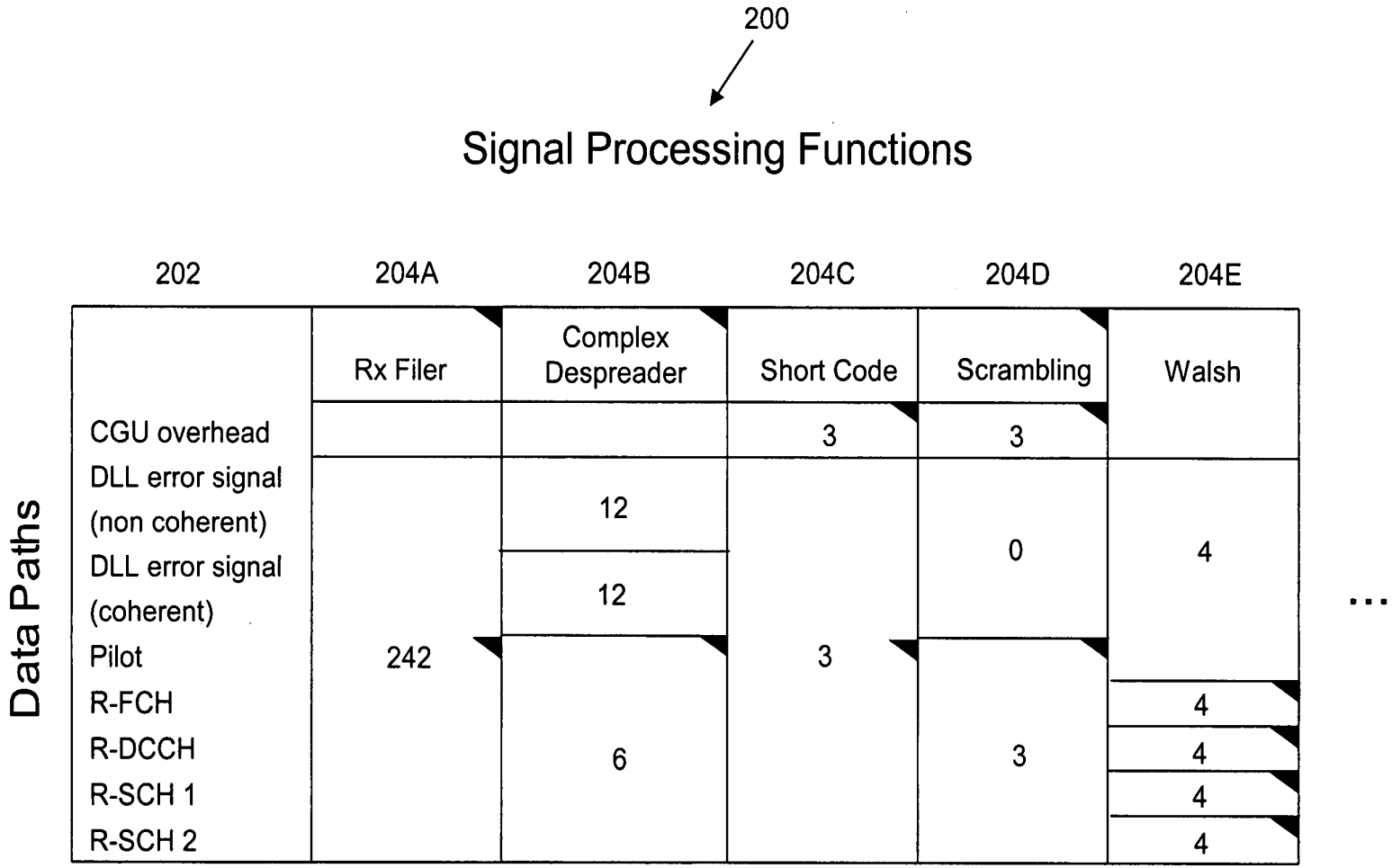


FIG. 7

220

	TDMA				CDMA				
	IS136	GSM	GPRS	EDGE	IS-95B	IS-2000	WCDMA-FDD	GPS	GLOBALSTAR
Parameter Estimation Functions									
IMS Channel Estimator		X	X	X					
Windowed Average Energy Estimator	X	X	X	X	X	X	X		
ML Symbol Timing Estimator	X	X	X	X	X	X	X	X	X
ML Carrier Phase Estimator	X	X	X	X	X	X	X	X	X
PN Correlator						X	X		X
Matched Filter							X	X	
Interference Energy Estimator						X	X		

FIG. 8

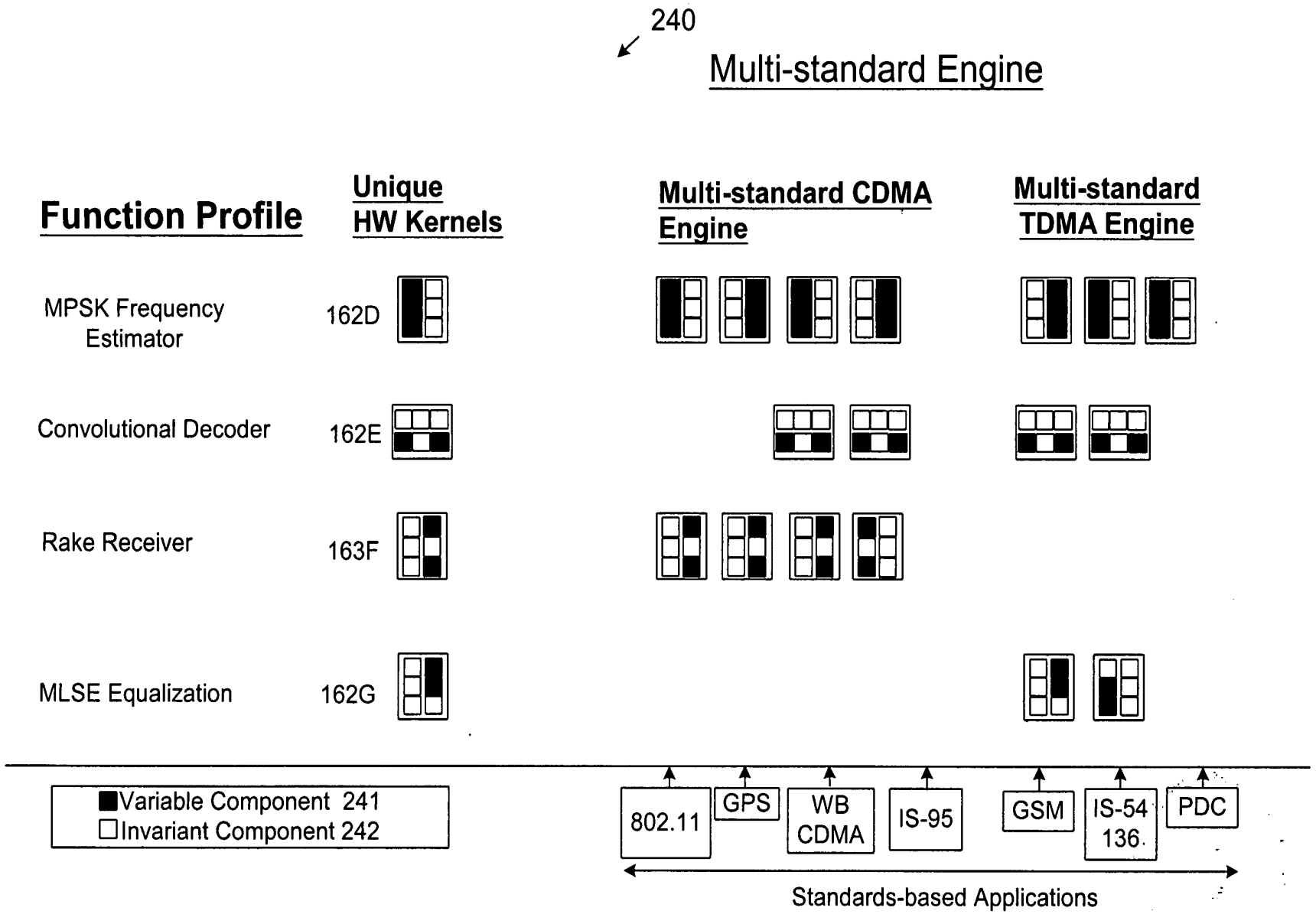

240
Multi-standard Engine
Function Profile
Unique HW Kernels
Multi-standard CDMA Engine
Multi-standard TDMA Engine
MPSK Frequency Estimator
162D
Convolutional Decoder
162E
Rake Receiver
163F
MLSE Equalization
162G
Variable Component 241
Invariant Component 242
802.11
GPS
WB CDMA
IS-95
GSM
IS-54 136
PDC
Standards-based Applications

FIG. 9

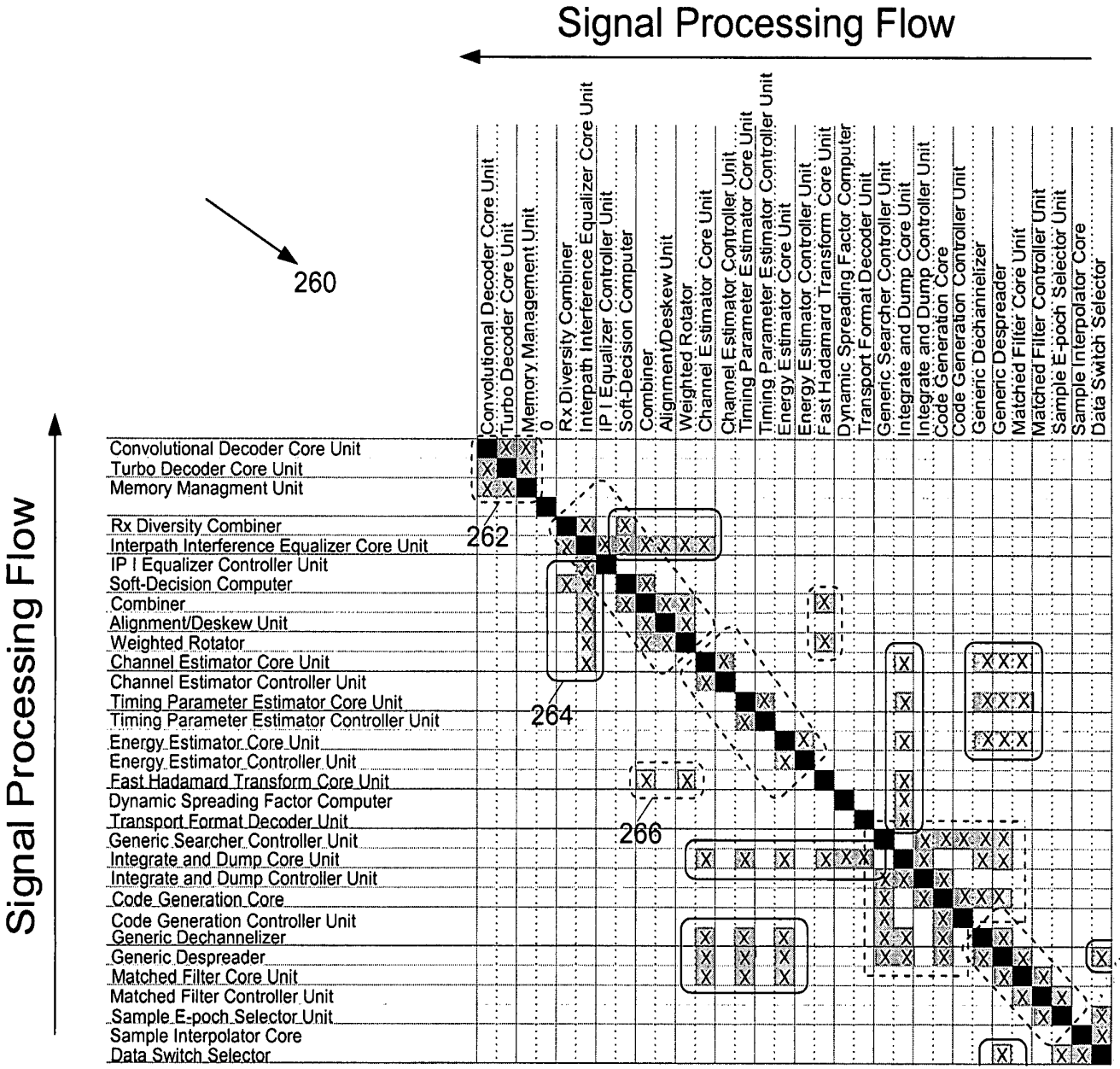

Signal Processing Flow
Signal Processing Flow
260
262
264
266
Convolutional Decoder Core Unit
Turbo Decoder Core Unit
Memory Managment Unit
Rx Diversity Combiner
Interpath Interference Equalizer Core Unit
IP I Equalizer Controller Unit
Soft-Decision Computer
Combiner
Alignment/Deskew Unit
Weighted Rotator
Channel Estimator Core Unit
Channel Estimator Controller Unit
Timing Parameter Estimator Core Unit
Timing Parameter Estimator Controller Unit
Energy Estimator Core Unit
Energy Estimator Controller Unit
Fast Hadamard Transform Core Unit
Dynamic Spreading Factor Computer
Transport Format Decoder Unit
Generic Searcher Controller Unit
Integrate and Dump Core Unit
Integrate and Dump Controller Unit
Code Generation Core
Code Generation Controller Unit
Generic Dechannelizer
Generic Despreader
Matched Filter Core Unit
Matched Filter Controller Unit
Sample E-poch Selector Unit
Sample Interpolator Core
Data Switch Selector

FIG. 10

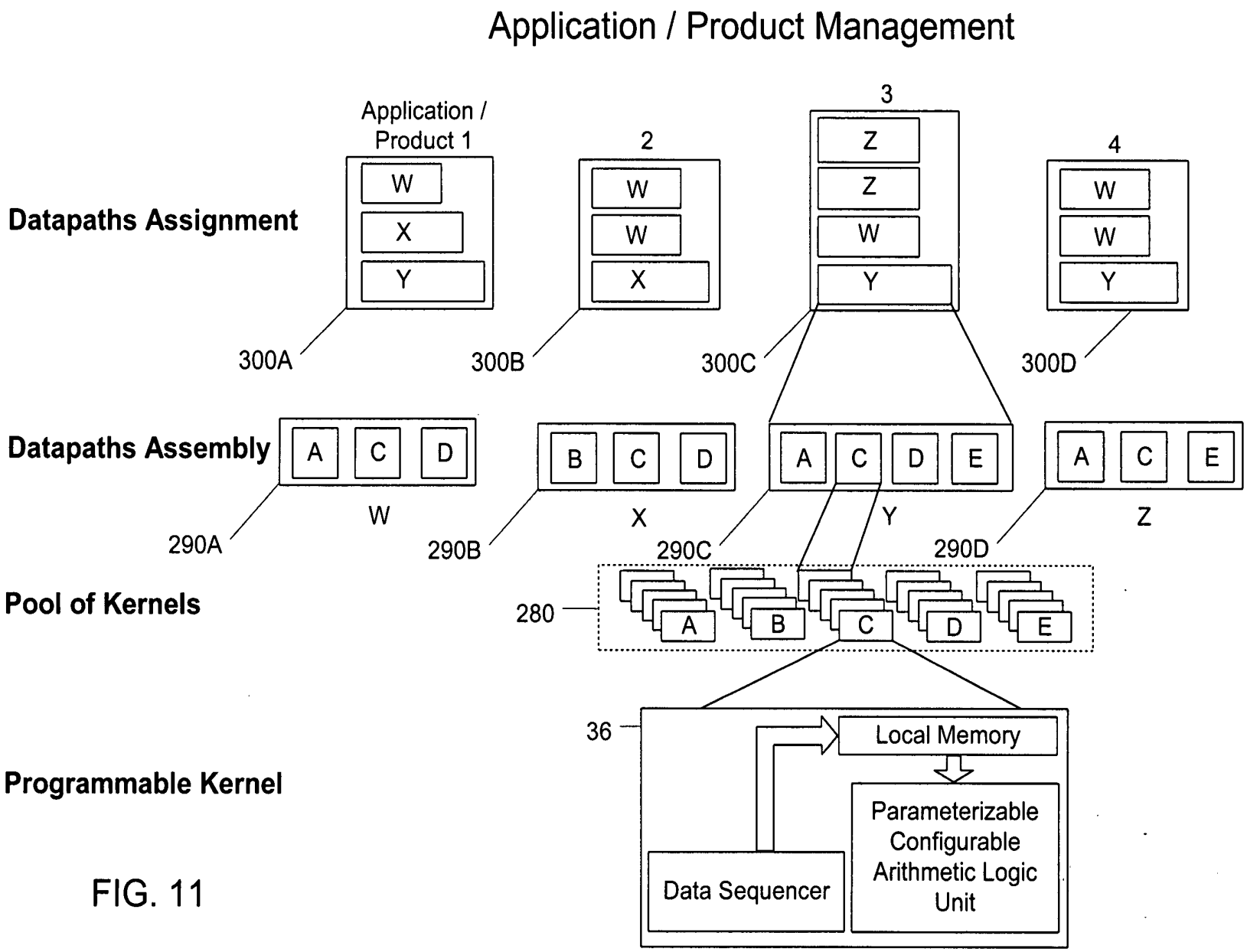

Application / Product Management
Datapaths Assignment
Application / Product 1
2
3
4
W
X
Y
W
W
X
Z
Z
W
Y
W
W
Y
300A
300B
300C
300D
Datapaths Assembly
A
C
D
B
C
D
A
C
D
E
A
C
E
290A
290B
290C
290D
W
X
Y
Z
Pool of Kernels
280
A
B
C
D
E
Programmable Kernel
36
Local Memory
Parameterizable Configurable Arithmetic Logic Unit
Data Sequencer

FIG. 11

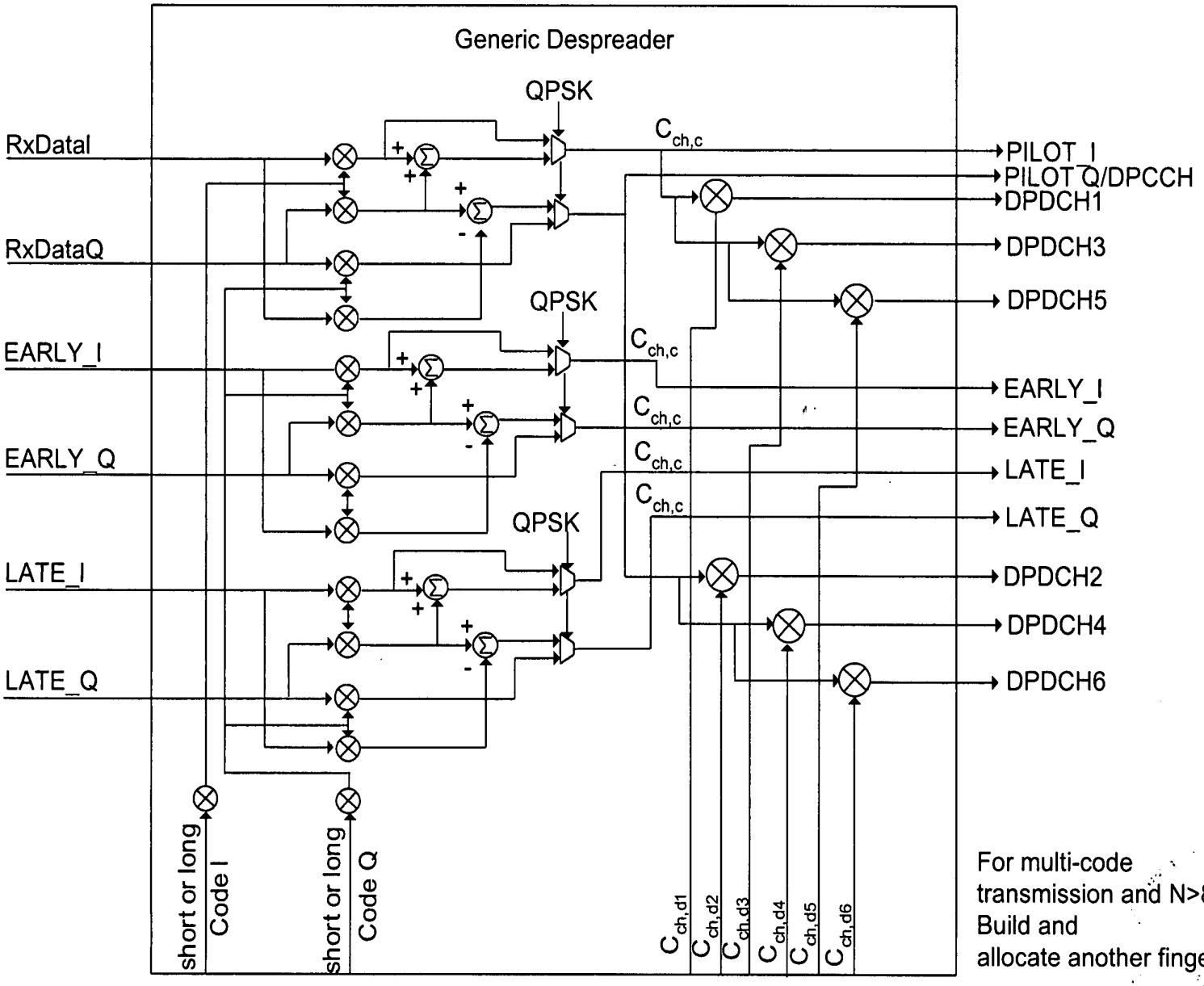

Generic Despreader
QPSK
QPSK
QPSK
RxDataI
RxDataQ
EARLY_I
EARLY_Q
LATE_I
LATE_Q
$C_{ch,c}$
$C_{ch,c}$
$C_{ch,c}$
$C_{ch,c}$
$C_{ch,c}$
PILOT_I
PILOT_Q/DPCCH
DPDCH1
DPDCH3
DPDCH5
EARLY_I
EARLY_Q
LATE_I
LATE_Q
DPDCH2
DPDCH4
DPDCH6
short or long Code I
short or long Code Q
$C_{ch,d1}$
$C_{ch,d2}$
$C_{ch,d3}$
$C_{ch,d4}$
$C_{ch,d5}$
$C_{ch,d6}$
Settings for 3GPP
For multi-code transmission and N>8 Build and allocate another finger

FIG. 12

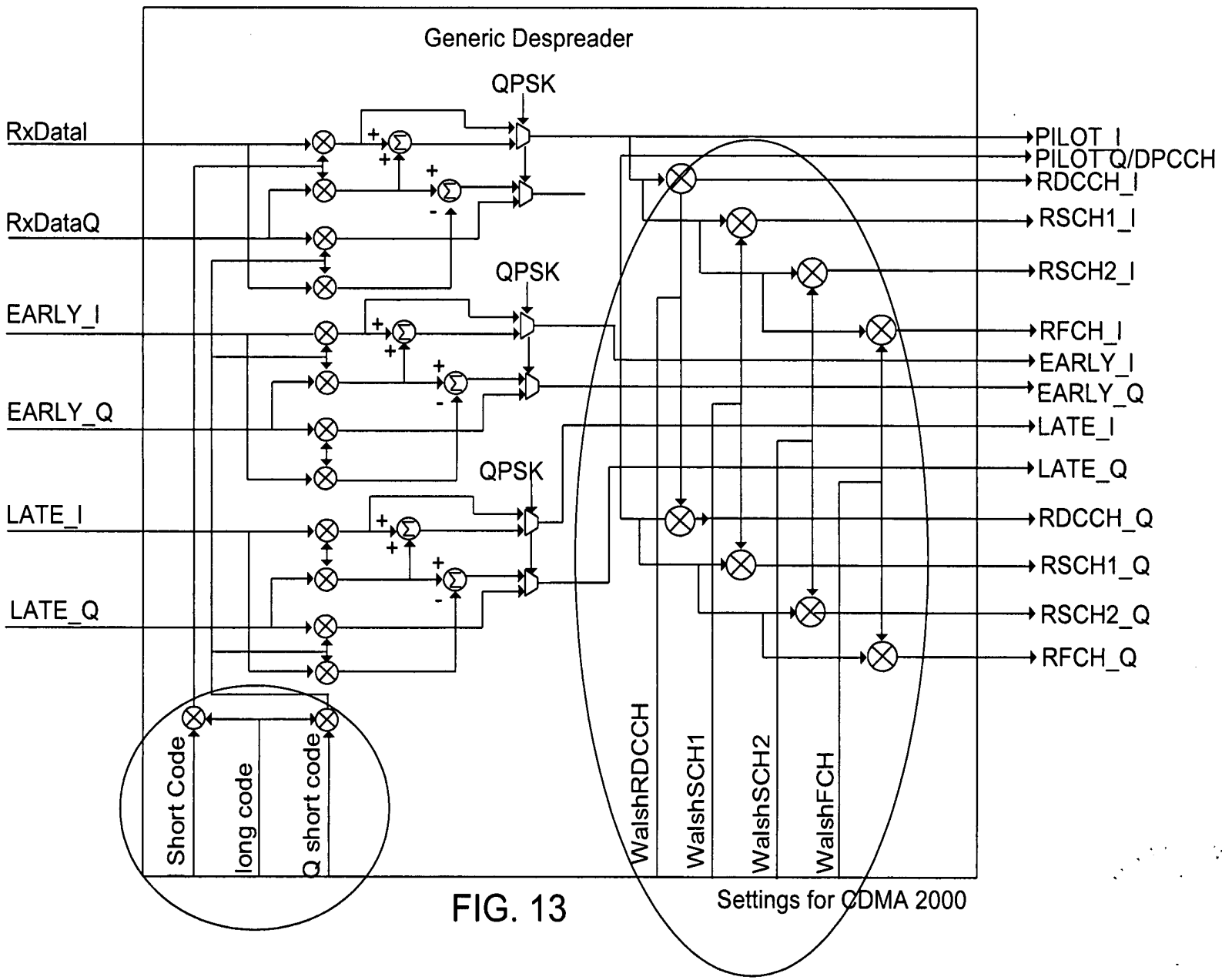

Generic Despreader
QPSK
QPSK
QPSK
RxDataI
RxDataQ
EARLY_I
EARLY_Q
LATE_I
LATE_Q
Short Code
long code
Q short code
WalshRDCCH
WalshSCH1
WalshSCH2
WalshFCH
Settings for CDMA 2000
PILOT_I
PILOT Q/DPCCH
RDCCH_I
RSCH1_I
RSCH2_I
RFCH_I
EARLY_I
EARLY_Q
LATE_I
LATE_Q
RDCCH_Q
RSCH1_Q
RSCH2_Q
RFCH_Q

FIG. 13

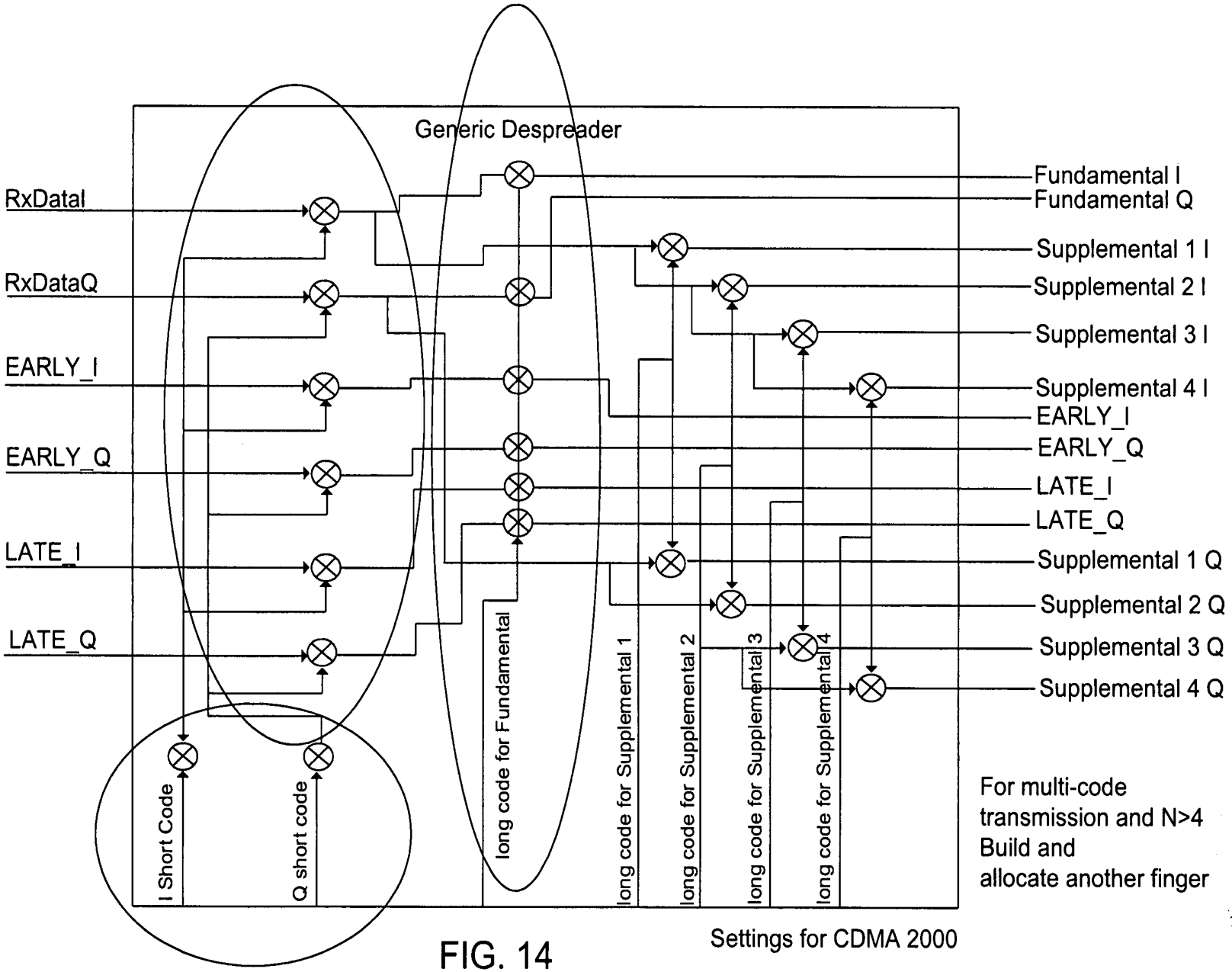

Generic Despreader
RxDataI
RxDataQ
EARLY_I
EARLY_Q
LATE_I
LATE_Q
I Short Code
Q short code
long code for Fundamental
long code for Supplemental 1
long code for Supplemental 2
long code for Supplemental 3
long code for Supplemental 4
Fundamental I
Fundamental Q
Supplemental 1 I
Supplemental 2 I
Supplemental 3 I
Supplemental 4 I
EARLY_I
EARLY_Q
LATE_I
LATE_Q
Supplemental 1 Q
Supplemental 2 Q
Supplemental 3 Q
Supplemental 4 Q
For multi-code transmission and N>4 Build and allocate another finger
Settings for CDMA 2000

FIG. 14

CDMA Computation Unit Library	
Front End Processing Sample Interpolation	*Parameter Estimation* Energy Estimator Timing Parameter Estimator Channel Estimator
Chip Rate Processing Sample Epoch Selection Matched Filter Generic Despreader Generic Dechannelizer Code Generation Unit Integrate and Dump Generic Searcher Control	*Channel Element Processing* Alignment/Deskewing Combiner Soft Decision Computer Interpath Interference Equalizer Receive Antenna Diversity Combiner
Symbol Sequence Processing Transport Format Decoder Dynamic Spreading Factor Computer Fast Hadamard Transform Rotator/Squarer	*Interleaving* Deinterleaver Controller
	Channel Decoding Turbo Decoder Convolutional Decoder

FIG. 15

TDMA Computer Unit Library	
TDMA Modem Transmitter Pulse-shaping Multiplexing	*TDMA Modem Receiver* Front-end Filtering Adaptive Demodulation
Link Adaptation (AMR) Antenna Transmit Diveristy	Synchronization Adaptive Parameter Estimation Diversity Combining Link Adaptation
Channel Decoder Reed Solomon Codes Decoding Fire Codes Decoding Decryption Deinterleaving	*Channel Encoder* Encoding Encryption Interleaving

FIG. 16

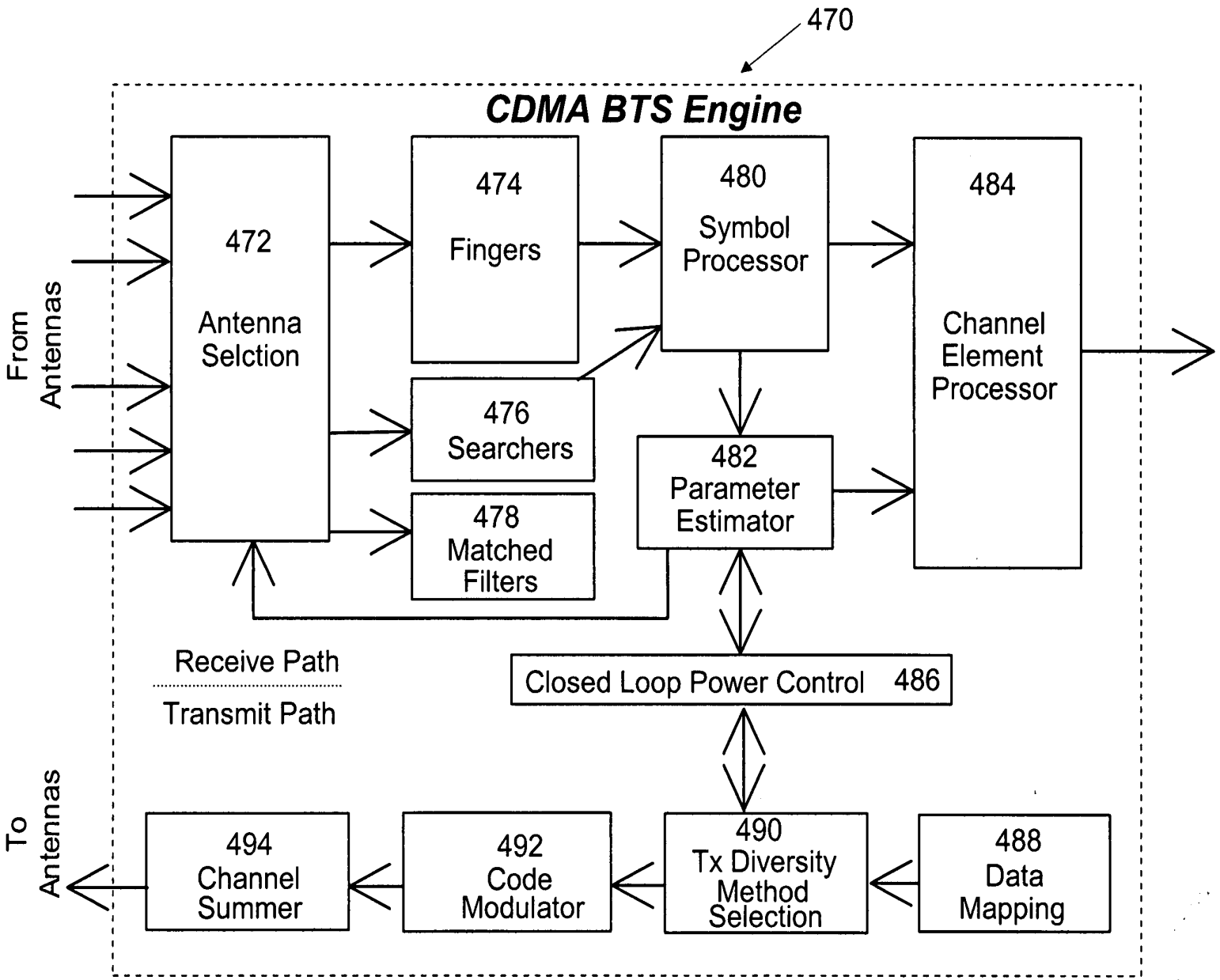

470
CDMA BTS Engine
From Antennas
472
Antenna Selction
474
Fingers
480
Symbol Processor
484
Channel Element Processor
476
Searchers
482
Parameter Estimator
478
Matched Filters
Receive Path
Transmit Path
Closed Loop Power Control 486
To Antennas
494
Channel Summer
492
Code Modulator
490
Tx Diversity Method Selection
488
Data Mapping

FIG. 17

TOOT20' 09025260

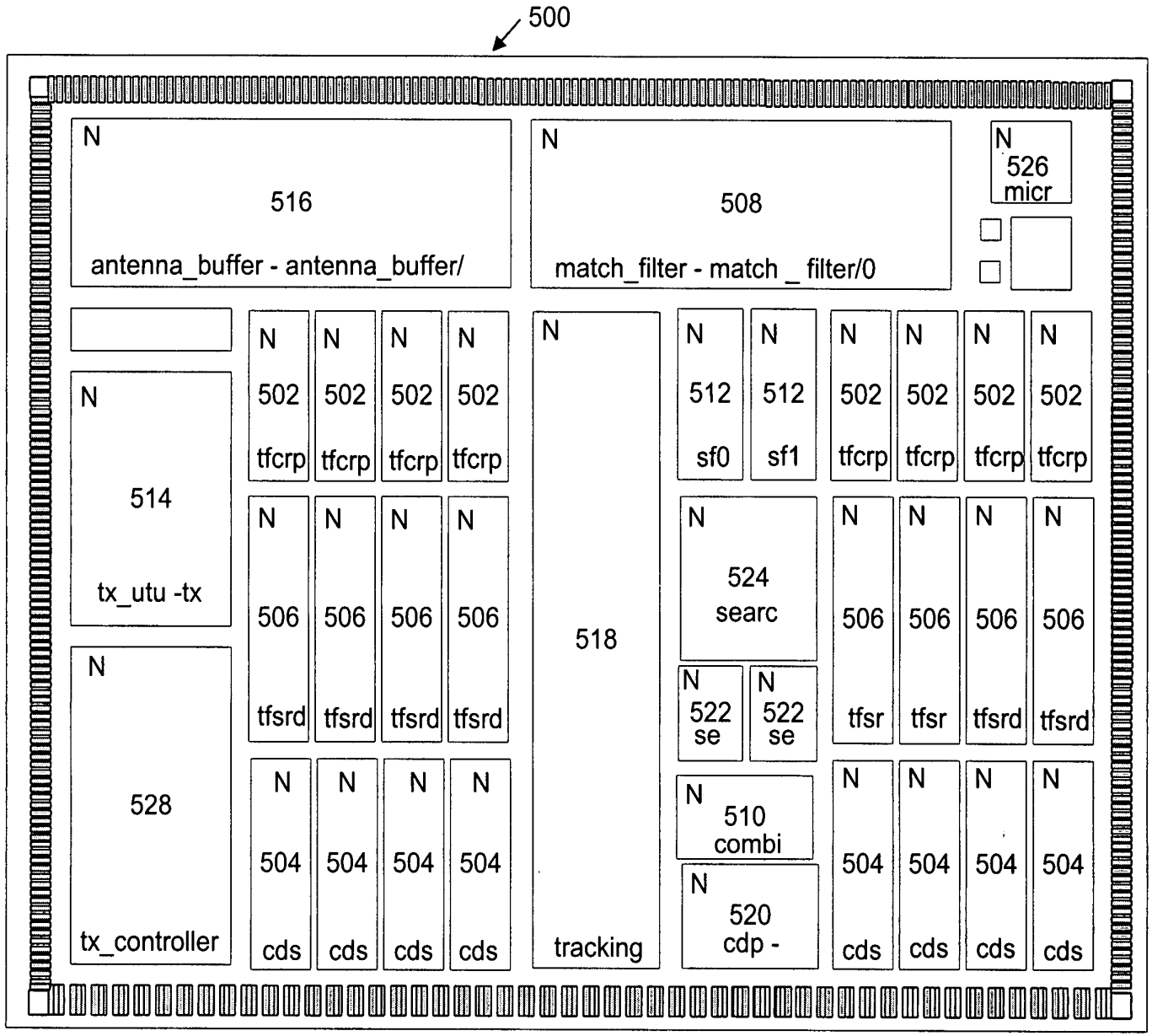


FIG. 18